

INCLUSIVELY DESIGNED MATERIALS FOR THE PLANNING PHASE OF OPEN INQUIRY-BASED LEARNING

THEORETICAL BACKGROUND

Open inquiry-based learning (IBL)

- opportunities for students to experience the process of scientific inquiry [1]
- students plan and conduct investigations in a self-determined way [1, 2]
- considered suitable to realize inclusive science education [2]
- requires high expertise of teachers to implement appropriate scaffolding [3]

Planning phase of open IBL

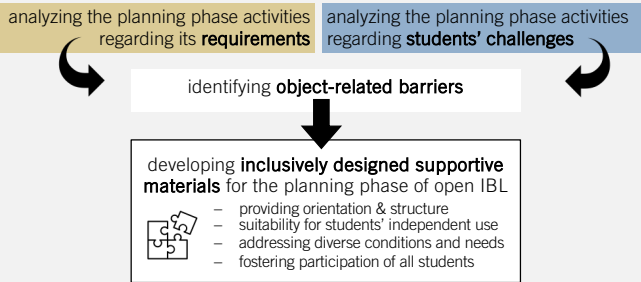
- determines the success of open IBL [4]
- includes demanding activities [5] (Tab. 1)
- often neglected in science lessons [6]
- challenging for many students [5, 7]

Phase	Inquiry Activities
Planning	generating a research question
	formulating a theory-driven assumption / hypothesis
	planning an investigation
Execution	conducting (and adapting) investigations and materials
	collecting data
	documenting data & process
Analysis	analyzing and interpreting data
	discussing and presenting findings
	communicating results

Table 1. Activities of open IBL

PURPOSE & AIM

Overarching goal: developing inclusively designed, non-topic specific material, which supports secondary science students in the planning phase of open IBL and thus enables them to participate in science learning



Research Questions

- RQ 1: What are the barriers (requirements & challenges) in the activities of the planning phase of open IBL?
- RQ 2: Which material approaches are suitable for reducing or addressing these barriers?

DESIGN & METHODS

Design-based Research (DBR) project [8] in three phases including six steps and iterative cycles to develop, test, and revise supportive materials for the planning phase of open IBL (see Fig. 1)

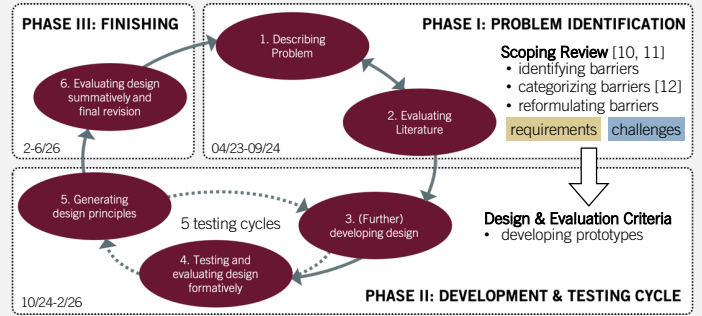


Figure 1. Design-based Research approach in the project (adapted from [9] p. 20)

Phase I: Problem Identification

- in-depth description of the problem
- identifying and analyzing barriers from literature and field experience

Phase II: Development & Testing Cycle

- defining design & evaluation criteria and developing prototypes
- testing, evaluating and revising the material successively in 5 iterative cycles
 - implementing material in an open IBL learning environment
 - testing material with N=5 science classes (grade 9, comprehensive schools)
 - evaluating material and collecting further barriers
- identifying (un)beneficial aspects and generating design principles

Phase III: Finishing

- summarizing findings, evaluating and final revision of the material

Table 2. Methods of Data Collection and Analysis

	Method	Data Material	Data Analysis
Phase I	Scoping Review [10, 11]	textbooks on research methodology empirical studies on students' challenges in the planning phase activities	Structured qualitative content analysis [12] with inductive category development
Phase II	Struct. participatory observation [13]	observation protocols of focused groups (ca. N=5 per class, ca. N=25 overall) Students' inquiry documentation sheets (N=1 per small group, ca. N=40 overall)	Evaluative qualitative content analysis [12] with deductive category application

FIRST RESULTS & OUTLOOK

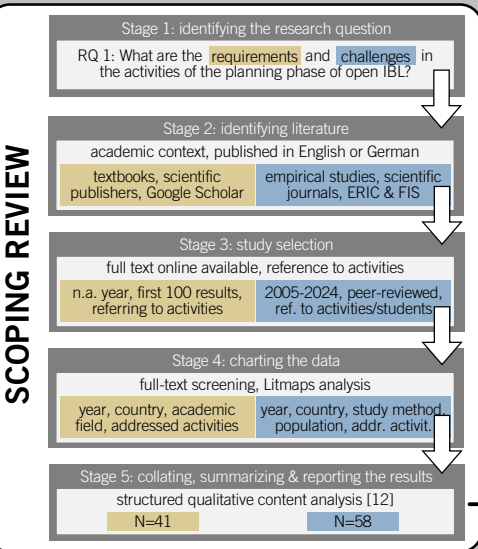
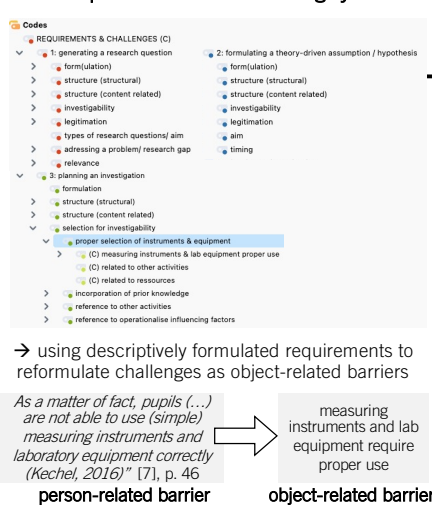
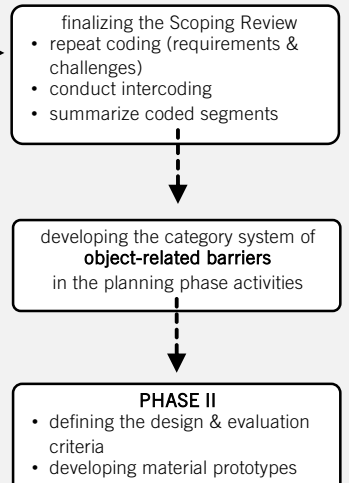


Figure 2. Stages of the Scoping Review (adapted from [10, 11])

Excerpt from the current coding system



NEXT STEPS



LITERATURE

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